SCIENCE

FRIDAY, NOVEMBER 9, 1888.

THE PAST SEASON has been one of unusually successful activity with the United States Fish Commission, a review of whose work is published elsewhere in this issue of *Science*. Probably the most important accomplishment during the year has been the establishment, at Gloucester and Wood's Holl, of stations capable of hatching four hundred million codfish-eggs, and which, with favorable weather, may be expected to put at least one-fourth of that number of cod-fry into the Atlantic Ocean during the present season. The problem of restocking the coast of New England with inshore cod, which has become so scarce except in Ipswich Bay, has been definitely solved. It is only a question of time, and a very short time at that, before codfish can be made to be more plentiful on the coast of New England than they were years ago, and a lost industry restored that will be worth millions of dollars to that section of the country. The only probable causes of delay are bad weather during the hatching-season, and anchor-ice, which kills the small fishes. It is known that only an infinitesimally small proportion of the fry hatched out at the fish-commission stations, and put into the rivers and lakes and the ocean, ever survive to reach maturity. It is only by planting an enormous quantity of the fry that the supply of fish is increased. It is claimed, that, of those artificially propagated, a much larger proportion survive than when the eggs are deposited naturally in the stream. In order to ascertain whether the number of small fishes to survive might not be enormously increased, Commissioner McDonald placed in a pond in Washington, in June, two million shad-fry. Eight hundred thousand of these are still alive, — breathing fishes from three to four inches long each. These will be kept until spring, and then placed in the Potomac. As a rule, they will by that time be able to take care of themselves. The remarkable success of this experiment may cause an entire change in the methods of artificially propagating shad. A new scheme of gathering up the small indigenous fishes hatched in ponds and lakes on the borders of Western and Southern rivers after their annual overflow, and planting them in the rivers, which, in many cases, have been depleted by over-fishing and the destructiveness of the floods, was put into successful operation this year. A hundred thousand fishes were thus rescued from sure death, when, later in the season, these lakes and ponds dry up. On the Pacific coast the steamer 'Albatross' has done the preliminary work of developing the extremely valuable halibut-fishing grounds that lie off the coast of Washington Territory and Vancouver's Island, convenient to the ports of Puget Sound, defined the boundaries of several deep-sea codfishing banks off the coast of Alaska, and will devote the winter to similar work in lower latitudes. The results of her first season's work are expected to be of very great economic value to the Pacific coast. These are but a few of the branches of work accomplished by the United States Fish Commission during the past season, though probably the most important. This commission is the most profitable of all the bureaus of the government, and ought never to lack for money.

ON NOV. 2 the following telegram was sent from Zanzibar: "Couriers from Tabora bring direct news from the Stanley expedition, a portion of which was met at the end of November, 1887, by Arabs trading between Lakes Victoria Nyanza, Mvutan Nzige, and Tabora. These Arabs met Stanley's rear guard at a point west of Mvutan Nzige, south-east of Sanga, just as the expedition was preparing to cross extensive swamps. The Arabs did not see Stanley. The detachment seen consisted of thirty men. They stated that Stanley was two days ahead. The expedition had suffered greatly on the march through a thick forest, where it was impossible to advance more than a mile and a quarter daily. They had also suffered in the marshes, where many had disappeared or died. Forty were drowned in crossing a great river flowing from east to west. One white man had died. Stanley was obliged to fight some tribes that refused to supply him with provisions. The expedition had often halted in the expectation of receiving re-enforcements from the Kongo. The rear guard, at the time met, had only been on the march five days after a halt of three weeks, due to the illness of Stanley and a great part of the escort, who had been attacked with fever. The Arabs estimate the total strength of the expedition, after all losses, at two hundred and fifty men. The health of Stanley was then good. The rear guard, which consisted of natives of Zanzibar, stated that Stanley had decided that he would no longer advance in a north easterly direction, but would strike toward the north, hoping to avoid the swamps. After getting a certain distance north, he intended to take an oblique line to the eastward, and go straight to Wadelai, where it was thought he would arrive fifty days later, — about the middle of January, 1888. The Arabs were of the opinion that the expedition was still strong enough to reach Wadelai." We hesitate to accept this news as authentic, as it corresponds too closely to the views recently expressed in numerous newspapers, particularly regarding Stanley's intention to turn northward. Sanga, which is mentioned in this despatch, was visited by Junker in 1882, and marks the south-eastern limit of our knowledge of this region. The Arabs, who claim to have met part of the expedition, must have penetrated beyond the limits of Unyoro. It will be remembered that on Lake Mvutan Nzige and Muta Nzige no information was obtained by explorers regarding the regions farther west, and that there seems to be little communication in this direction. Therefore the report would imply that the Arabs had recently succeeded in opening this country to their trade. Besides this, their route must have led along Lake Mvutan Nzige, where Emin had re-established, a year since, his influence. Therefore it seems somewhat remarkable that no mention is made of Emin Pacha. Another despatch which was received on Aug. 1 in Zanzibar is undoubtedly an invention. It was stated that two messengers had arrived there who had left the interior about the beginning of April, and who reported that Stanley had not arrived at Wadelai up to that time. The messengers stated that in the month of March Emin Pacha did receive some vague and indecisive news of the explorer, which had filtered through from tribe to tribe, but that the reports were very conflicting. Some declared that Stanley, after losing a number of men and a large portion of his supplies, was hemmed in by hostile tribes between the Mabode country and the Mvutan Nzige, while other rumors were to the effect that he had been attacked by the tribes in the Matongora-Mino district, and after several conflicts had diverted his course in an unknown direction. The wording of this despatch is almost exactly the same as that of another received about fifteen months ago, and therefore it cannot be accepted as genuine.

THE ERUPTION OF KRAKATOA.

THE Krakatoa committee of the Royal Society has made its final report,[1] which forms a large quarto volume, and contains a mass of material of the greatest interest. After the remarkable phenom-

[1] The Eruption of Krakatoa, and Subsequent Phenomena. Ed. by G. J. SYMONS. London, Trübner.

ena following the eruption of Krakatoa on Aug. 27, 1883, became first known, and when the optical phenomena attracted increasing attention of the whole civilized world, the Royal Society of England, on Jan. 17, 1884, passed the following resolution: "*Resolved*, That a committee, to consist of Sir F. Evans, Professor Judd, Mr. Norman Lockyer, Mr. R. H. Scott, General Strachey, and Mr. G. J. Symons, with power to add to their number, be appointed, to collect the various accounts of the volcanic eruption at Krakatoa, and attendant phenomena, in such form as shall best provide for their preservation, and promote their usefulness." A history of the work of the committee is detailed in the preface, its expansion by fusion with a committee of the Royal Meteorological Society and by election of new members, and its method of proceedings. At the end of November, 1884, the discussion of the data collected was commenced, which were divided into five portions, each going to a separate sub-committee, and each giving a separate report, which forms the present volume. Thus the work is divided into five parts: 1. 'On the Volcanic Phenomena of the Eruption, and on the Nature and Distribution of the Ejected Materials,' by Prof. J. W. Judd; 2. 'On the Air-Waves and Sounds caused by the Eruption,' prepared in the Meteorological Office, and presented by Lieut.-Gen. R. Strachey; 3. 'On the Seismic Sea-Waves caused by the Eruption,' by Capt. W. J. L. Wharton; 4. 'On the Unusual Optical Phenomena of the Atmosphere, 1883–86, including Twilight Effects, Coronal Appearances, Sky Haze, Colored Suns, Moons, etc.,' by the Hon. F. A. Rollo Russell and Mr. E. Douglas Archibald; 5. 'Report on the Magnetical and Electrical Phenomena accompanying the Eruption,' by G. M. Whipple.

While the Dutch report by Verbeek deals with the local phenomena, the English committee paid specal attention to the meteorological and other occurrences which took place all over the earth.

The most interesting part of Professor Judd's account is his theory as to the part played by water in causing or aiding eruptions. He believes that the disengagement by heat of volatile substances actually contained in the lava is the primary cause of volcanic activity. He proves that the melting-point of all lavas of Krakatoa of different ages, although of the same chemical composition, vary to a great extent according to the amount of water contained in them, their fusibility being greater when water is present. In this case, on melting, they develop a great amount of gases. "In this way the actual nature of the volcanic manifestations at any particular vent are seen to be determined, not so much by the mineralogical constitution of the lava, as by the circumstance of the quantity of water contained in the magma. Where this is great, the lava will be perfectly liquid, and will be almost wholly thrown out in the form of pumice and dust. On the other hand, lavas containing little water will require a very high temperature for their fusion, and they will be characterized by great viscosity rather than perfect liquidity. It is through the introduction of the sea and other surface waters into rock masses by slow percolation from above, and the consequent formation of new compounds, more readily acted upon by subterranean heat, that I am disposed to regard volcanic phenomena as being brought about. In this we find an explanation of the proximity of volcanoes to great bodies of water, which, it seems to me, is far more in accord with the actual phenomena than the supposition that water finds access to volcanic foci by means of actual open fissures."

Professor Judd shows very clearly that the effect of the inrush of water upon lava is quite different, and, especially in the case of Krakatoa, resulted in the formidable violence of the eruption. When the volcano became so far eviscerated as to give access to the water of the sea, the latter cooled the surface of the magma, and as a result the activity of the volcano diminished. As, however, the disengagement of volatile substances actually contained in this material continued, the formation of this crust would have the same effect as fastening down the safety-valve of a steam-boiler, while the fires below were maintained in full activity. This constant augmentation of tension beneath Krakatoa, in the end gave rise to the tremendous explosions which made the eruption of the volcano so remarkable.

In the second part, General Strachey discusses the remarkable atmospheric oscillations, which, starting from Krakatoa, moved as many as seven times over the earth. Their propagation from the volcano to its antipodes and back is shown on a number of interesting maps. The principal results of the inquiry into the movements of this disturbance are, that it had very nearly the characteristic velocity of sound, ranging from 648 to 726 English miles an hour, and that its mode of propagation by an aerial oscillation of comparatively short duration was also closely analogous to that of sound. Waves travelling with and against the direction of the earth's rotation show differences of velocity of about twenty-eight English miles an hour. This may probably be accounted for by the circumstance that the winds along the paths of this portion of the wave would, on the whole, have been westerly, which would have caused an increase of velocity in the wave moving in the opposite direction; so that the observed difference of twenty-eight miles could be produced by an average westerly current of fourteen miles per hour, which is not unlikely.

The author continues, "There is some appearance of a greater retardation of the wave in passing in a direction opposed to the earth's rotation over the northern European stations as compared with those in the south of Europe, which may possibly be due to the lower temperature of the more northern part of the zone traversed. This difference is not to be traced in the wave moving in the opposite direction, which may be accounted for by the path of the wave, when approaching Europe from the west, having lain for a long distance over the Atlantic, where the differences of temperature between the northern and the southern borders of the zone traversed would have been relatively small.

"The path of the wave that passed over the Canadian and United States stations, and Havana, lies nearly on the meridian drawn through Krakatoa, and must have crossed both the polar circles near the poles. The velocities obtained from these stations are peculiar. The direct wave from Krakatoa, which travelled nearly due north and close to the north pole, and its repetitions after passing round the earth in the same direction, had nearly the same velocities as those observed at the European stations, with an apparent decided retardation in the intervals between the first and third passages, and (but to a less extent) between the third and fifth. The wave that passed through the antipodes before reaching the North American stations went nearly due south close to the south pole; and its velocity on this its first partial passage round the earth was very decidedly reduced; but in its next complete circuit the velocity appears to have been much increased, almost reaching the full rate of the true sound-wave. It is difficult to account for this, but the fact seems to be indisputable. Probably an explanation of this peculiar feature of the phenomena may be found in the conditions of the wind and weather in the southern ocean during the days on which the wave passed over it, which are not known to us."

In the second part of General Strachey's report a list of places is given at which the sounds of the explosions at Krakatoa were heard on the 26th and 27th of August. In all directions the sound was heard at a distance of two thousand miles from the volcano, while south-westward it was even noticed at Rodriguez, very nearly three thousand miles from Krakatoa.

Captain Wharton, in his discussion of the seismic sea-waves caused by the eruption, distinguishes two descriptions of waves, — long ones, with periods of over an hour; and shorter but higher waves, with irregular and much briefer intervals. The greatest disturbance which followed the great explosion of the volcano resulted in waves about fifty feet high in the Strait of Sunda, and caused the vastest destruction. The speed of both classes of waves was about the same, and it is remarkable that it was in all cases less than the depth of water would demand according to theory. To the north and east in the Java Sea the long wave can be traced for 450 miles, but it was at this distance reduced to a very small undulation. To the west, on the other hand, the long wave travelled over great distances, and reached Cape Horn and the shores of Europe. The shorter waves did not extend beyond Ceylon and Mauritius. South-eastward the disturbance did not continue beyond the west coast of Australia; the disturbances noted in New Zealand and in the Pacific evidently being caused by other seismic action, and having no connection whatever with the eruption of Krakatoa.

By far the greater portion of the report is taken up by the dis-

cussion of the unusual optical phenomena of the atmosphere, of which so much has been written. This part is divided into a number of sections, of which the first describes fully the phenomena, and is illustrated by two magnificent chromolithographs. In the long discussion on the proximate cause of the unusual twilight phenomena, F. A. Rollo Russell arrives at the conclusion that a dry haze at a great altitude was their cause. The physical conditions of this phenomenon were the reflection of sunlight on small vitreous surfaces when the intervening air is darkened. He rejects the theory that condensed vapor caused the unusual twilight phenomena, for a number of reasons, principally because spectrum observations and the nature of the corona do not support this view. Besides this, the structure of the haze resembled more that of smoke than that of the highest clouds; and previous effects seen in years of great eruptions, and in places affected by an excess of dust in the air, are very much like those observed in 1883 and the following years. In the same section of the report the colored appearances of sun and moon, which were confined to the tropics, the sky haze, and the corona, are discussed. E. Douglas Archibald, who is the author of the last-mentioned part of the report, describes the corona, which is generally known as 'Bishop's ring,' very thoroughly, and shows that it was probably formed in the haze stratum, and that it was formed by diffraction. Its great size proves that this haze was composed of exceedingly small particles, the diameter of which is computed at .00159 of a millimetre. The occurrence of a corona at a very high altitude, as well as the general absence of accompanying refractive halos, tends to show that the particles through which the diffraction took place were solids and dust rather than ice. Although the corona was associated with the twilight glows and colored suns in being produced by the same elevated haze, it was physically distinct from either, and probably contributed only very slightly to the glows after the sun sank below the horizon.

A long list of dates of the first appearance of optical phenomena — a result of a careful scrutiny of numerous periodicals, logs, and of an extensive correspondence — serves as the basis of a study of the geographical distribution of the various sky phenomena, which proves that it spread rapidly westward, having a velocity of about seventy-six miles an hour.

The researches of E. Douglas Archibald on the height of the glow stratum are of great interest. We will not enter here upon his discussion of Professor Kiessling's theories, as this was the subject of a letter recently published in *Science* (No. 298). The principal results of his inquiry are the following: In the brilliant glows which began in the tropics after the eruption of Krakatoa on Aug. 26 and 27, there is distinct evidence of a primary glow caused by the direct rays of the sun, and of a secondary glow succeeding this, and due to reflection of the primary glow through the same stratum. These primary and secondary glows correspond to the first and second crepuscular spaces of ordinary twilight, the main difference between the secondary of the present series and the ordinary second crepuscular space being that the former was colored, whereas the ordinary second twilight is white, and seen only from high altitudes or in peculiarly favorable circumstances. The glow-causing material appeared suddenly and at about its greatest height at first near Krakatoa, and on its subsequent spread into the extra-tropics it appeared at a lessened altitude. The height of the upper or middle part of the stratum progressively diminished from 121,000 feet in August, to about 64,000 feet in January, 1884. By April, 1884, a considerable portion of the larger reflecting particles had sifted out by gravitation, causing a minimum duration and brilliancy of the secondary glow. As this occurred simultaneously with a maximum development of the corona, it appears probable that a large portion of the finer material remained in suspension at nearly the same height as at first, and that, having become more homogeneous than at first, it was rendered capable of exerting its maximum diffractive power. In the autumn and winter months of 1884 and 1885 the brilliancy of the glows was partially renewed, and thus it is rendered impossible to arrive at any certain deductions regarding the rate of descent of the stratum as a whole. The final effects of the glow-causing material were produced by the prolonged reflection from the lofty stratum of rays partly deprived of their red component by the action of the stratum itself, and to a much larger extent subsequently deprived of their blue components by the ordinary dust and vapor particles of the lower atmosphere. It was therefore mainly an intensification of ordinary twilight phenomena, consequent on the presence, at a lofty altitude, of solid particles not usually existent there.

The whole volume is full of information of the greatest value, and the mass of material collected, as well as its thorough discussion and the clear mode of its treatment, deserves our fullest admiration.

THE UNITED STATES FISH COMMISSION'S WORK DURING THE PAST SEASON.

THE United States Fish Commission has accomplished more, both of practical work and in the line of original investigation looking to practical work in the immediate future, this year than during any previous season of its history. A brief review of its work in both of these departments is given herewith.

An account of the shad-hatching operations of the commission last spring, and a description of the experiment of shipping lobsters to California, and the planting of them in the Pacific Ocean north and south of San Francisco, were given in *Science* (xi. 246, xii. 27) several months ago. In connection with shad-hatching, Commissioner McDonald has been trying this summer a very important and interesting experiment. It is well known that the young shad-fry hatched at the United States Fish Commission stations are not kept until they become little breathing fishes. No means of accommodating them have heretofore existed. It is also known that the mortality among young shad is far greater in the earlier than in the later periods of their existence. The longer they live, the better the chance they have of continuing to live. It is known that only an infinitesimally small percentage of the shad-fry placed in rivers in the spring survive and come to maturity; but so enormous is the number hatched and planted, that those that do escape the scores of enemies they encounter are sufficient to stock abundantly, in a few years, the stream in which they are placed.

This year Colonel McDonald secured on a government reservation in Washington the use of a pond about six acres in extent. In this he caused to be placed, in June, two million shad-fry, and there are now in the pond eight hundred thousand young breathing shad from three to four inches in length. These will all be turned into the Potomac next spring, when they will be much larger than now; and the result will be that the number of fishes put into the river at the opening of the next season will be three times as great as the number taken out last season. The percentages of survivals is probably some thousands of times greater than if the fry had been placed in the river soon after they were hatched. In connection with the work of stocking other streams, and in view of the success that has attended this first experiment, much attention will hereafter be given to the propagation of shad in ponds.

During the past summer a new and very important branch of work has been taken up. When a freshet occurs in the Lower Mississippi River, it inundates a belt of country of an average width of about sixty miles, and the territory along its tributaries is covered with water to an extent varying with the topography of the country and the sizes of the rivers. These floods carry with them, of course, enormous quantities of the indigenous fishes of the rivers; and when the waters recede, ponds and lakes are left in the frequent depressions of the surface. These often actually swarm with fishes and with the millions of fry that have been naturally hatched in them. But later in the season a majority of these ponds and lakes dry up, and not only the mature fishes, but the millions of young ones perish. Colonel McDonald this year sent to these Western and Southern rivers the cars of the Fish Commission, with a sufficient force to seine these ponds and lakes, gather up the small fishes, and to plant them in the rivers where they naturally belong, many of which have been depleted by over-fishing and by the effects of the floods. More than a hundred thousand young fishes were thus planted during the past season; and it is the intention of Commissioner McDonald, in restocking the rivers of the West and South with indigenous fishes, to utilize in the way described nature's great hatcheries, instead of incurring the much greater risk and expense of artificial propagation.

The rivers operated upon during the past season were the Ohio

and Muskingum in Ohio, the Blue River in Indiana, about twenty rivers and ponds in Illinois, the Barren and Green Rivers in Kentucky, and the Current River in Missouri, besides a number of lakes, Geneva Lake in Wisconsin, and the Blue, Beaver, and Alcorn Rivers in Nebraska. The varieties of edible fishes planted in these rivers include all the common kinds, such as spotted cat, crappie, or fresh-water drum, several species of bass, white perch, and pickerel.

On the Pacific coast the propagation of salmon was renewed, and during the season about five million salmon-fry were placed in the Columbia and McCloud Rivers and in the shorter streams on the coasts of California and Oregon.

On the Great Lakes the propagation of whitefish has been continued, but on a far greater scale than ever before.

In former days the inshore cod and halibut fisheries on the coast of New England were exceedingly valuable, as they still are on the Pacific coast. Thousands of men of small means, and owning little boats and comparatively primitive apparatus, earned comfortable livings by fishing for cod in the Gulf of Maine, Massachusetts and Cape Cod Bays, Vineyard Sound, Long Island Sound, and at many other points along the coast. The fishes were taken in abundance and sold fresh, — the most profitable way to the fisherman. But this source of wealth has been largely destroyed by over-fishing; and in few places along the whole coast of New England, outside of Ipswich Bay, are the cod plentiful enough to pay the fishermen for attempting to take them. To catch cod or halibut in large quantities now, one must go to the offshore banks; and this a majority of these inshore fishermen are too poor to do, or they have domestic ties that keep them at home, or they think the risk too great or the labor too severe to be compensated for by the average 'fares.' The halibut were the first to disappear, and the cod and lobsters have also been caught up; so that now all three are very scarce. These inshore cod never migrate to the offshore banks. During a part of the season they remain quite near the shore, and later move out into deeper water, but never to a great distance from the points where they are found during the fishing-season.

In 1878 it was demonstrated by experiments made by the United States Fish Commission that the eggs of the inshore cod could be artificially hatched, and that the small fishes that survived would return to the shore the next year. A majority of the young cod were, however, killed that year by anchor-ice. Several times subsequently small quantities of inshore codfish-eggs were artificially hatched, but last year the hatching of these codfish-eggs was begun on a large scale. The result was entirely satisfactory. Thousands of the young cod that were hatched during the season of 1887 were seen last spring and summer, and there is no longer any doubt that the inshore fisheries of the New England coast may be restored. This will be as important a result (probably more important) as the work which the Fish Commission has accomplished in regard to stocking rivers with shad; and, according to conservative estimates, the increase in the supply of this valuable food-fish, as a result of the work of the commission, is, in actual value, very much greater than the entire cost of the commission, with all its varied work, from the time of its foundation to the present.

Preparations have now been made for the artificial propagation of inshore cod during the present season on an immense scale. The stations have a capacity for handling four hundred million eggs; and, if the season is favorable, about one-fourth of that number will probably be hatched. The principal obstacles are stormy weather and anchor-ice.

In Maine and upon the Hudson River the work of propagating salmon has been prosecuted during the past season.

During the last twelve months, new fish-commission stations have been established or re-opened, as follows: Clackamas station on the Columbia River, and Baird station on the McCloud River, for salmon-work, put into operation again; an extensive station at Duluth for the propagation of whitefish and trout; a large station at Gloucester, Mass., for the hatching of the eggs of inshore cod. The United States Fish Commission is operating, during the present season, the State station at Sandusky, O., in the propagation of whitefish. Congress, during its late session, provided for a large station at Neosho, Mo., for the propagation of trout and the indigenous fishes of the region. This will be completed by the end of the fiscal year, and is expected to benefit Missouri, Arkansas, Kansas, Texas, and western Louisiana.

The most extensive and important work done by the Fish Commission during the past season, in the way of exploration with a view to future practical results, was that accomplished by the steamer 'Albatross' on the Pacific coast. This steamer, which, since she was built five years ago, had been engaged in work on the Atlantic coast, started around the Horn after the close of last season. She arrived in San Francisco late in the spring, and, July 4, sailed for the Alaskan fishing-grounds. It has been known that the sea-fisheries of the Pacific coast are very extensive and very rich, but they are practically undeveloped except in the vicinity of San Francisco. The purpose of the commissioner in sending the 'Albatross' to the Pacific Ocean was, by a series of careful surveys, to ascertain the locations of the sea-fishing grounds of all kinds, their extent, character, productiveness, their nearness to market, the kinds of bait that might be used, the methods of obtaining it and its abundance, and, in short, to develop the sea-fisheries of the Pacific coast.

Important banks are distributed along the coasts of Washington Territory and Vancouver's Island, at points easily accessible from the ports in Puget Sound. The fishes upon them are very abundant. They swarm with halibut, and also furnish cod in abundance. It was on these grounds that the Gloucester fishing-vessel, 'Mollie Adams,' owned by Capt. Solomon Jacobs, did her successful halibut-fishing during the last summer. She kept her halibut fresh, and shipped it in that condition to the New York and Boston markets, where, in no way inferior to that landed at Gloucester, it was sold at eight cents per pound, while the price of Eastern halibut was twelve cents a pound.

It must not be inferred from this that Pacific coast halibut can compete successfully in New York and Boston with that caught on the Grand Banks. In the first place, the price at which the Eastern halibut was sold was not the natural one, but had been fixed arbitrarily by a 'trust.' Yet the Pacific coast fishermen have some very important advantages. Three or four trips can be made there to one to the great banks of the Eastern coast. These Pacific coast fisheries are also conveniently near ports of shipment. Then Captain Jacobs secured unusually low rates of freight; and, even if he had made no money, he would undoubtedly have sent his fresh halibut East in a spirit of bravado, and to show those people who had laughed at him for taking the 'Mollie Adams' to the Pacific Ocean that he didn't go on so much of a fool's errand, after all.

The permanent markets for fresh halibut caught on the Pacific coast will be San Francisco, and other cities and towns of California that are rapidly growing into importance; the great mountain cities of Salt Lake City, Denver, etc.; and all the Mississippi valley as far east as Chicago, and extending north and south from Duluth to New Orleans. In all this vast territory the reduced expense of catching halibut will enable the Pacific coast fishermen to compete successfully with those who land their fresh halibut at Gloucester.

In Alaska the fishing-banks correspond in their extent, character, kinds, and abundance of fish, with the great offshore fishing-banks of eastern North America. They are inhabited by the same species of cod and halibut that occur on the east coast; and, although the general positions of these Alaskan banks has been known for some years, they have never been surveyed, and the few fishermen who resort to them find the rich spots by trial, and return to them from time to time. The most important of these banks are situated just off the coast from Unalaska to some distance east of Kadiak Island, — an extent of from six hundred to seven hundred nautical miles: that is to say, that, throughout the region whose boundaries have been given approximately, the fishing-banks are as well defined as those on the Atlantic coast; but good fishing occurs both to the north and south throughout the Alaskan coast, while on the north the cod-fishery is limited only by ice.

These banks are a very valuable and important possession. Great quantities of cod are now to be found there, and an industry can be built up that may be made very profitable to the Pacific seaports. Of course, the cod caught on these banks will be salted, and the markets for them will be almost unlimited. They will comprise, besides our own country, the western parts of Mexico,

Central and South America, Japan, China, Australia; in short, the entire populations who live upon or near the Pacific and Indian Oceans.

It is the mission of the 'Albatross' to explore all the fishing-grounds on the Pacific coast. It is expected that she will remain at work the whole year, except during periods occupied in refitting and repairs, and that three or four years will be spent in completing the work. She will spend the summer in the north, working southward as winter approaches. Some of her winter work will be done on the coast of southern California.

The 'Albatross' returned to San Francisco Oct. 21, from her first cruise to the north. She had spent about two and one-half months upon the Alaskan fishing-grounds, and one month in the region off Cape Flattery. A very careful series of soundings was made of the grounds visited; and these, when plotted on charts and represented graphically, will give the contour of a very large fishing-area, to which the attention of fishermen will be called. In addition to this, the regular observations were made to determine the temperatures and densities of the water, the relative abundance of edible fishes on different parts of the banks, the character of the bottom, etc. All kinds of collecting and fishing appliances were constantly and successfully used; and an extensive collection of specimens was secured, which will be studied in the laboratories in Washington, in order to determine the principal natural features of the fishing-grounds. Lieut.-Commander Z. L. Tanner, U.S.N., is in charge of the expedition, having commanded the 'Albatross' ever since her construction in 1883. He has been in active service with the Fish Commission about nine years. Mr. C. H. Townsend is the naturalist, and Mr. A. B. Alexander the fishery expert, of the expedition.

The experimental station at Wood's Holl was kept open during the summer, as usual, from early in July to October. The commissioner himself was present there during most of the time with Prof. John A. Ryder, in charge of the scientific work. From twelve to fifteen volunteer naturalists, including Prof. W. K. Brooks of Johns Hopkins University, were at work at the Wood's Holl station during most of the time. The steamer 'Albatross' having gone to the Pacific coast, and regular explorations on the offshore fishing-banks being therefore suspended, the work of the season consisted mainly in a study of embryology with regard to its bearing upon the fish-cultural branch of the Fish Commission's work. Many studies were also made of fishes and their habits in later stages of development. A quantity of English soles had been brought to this country last spring, and had been kept in a compartment of the laboratory at Wood's Holl. They were planted in Vineyard Sound in October.

The steamer 'Fish Hawk' was employed for about two months in examining the oyster-beds of Providence River, Narragansett Bay, and Long Island Sound near New Haven, with especial reference to the depredations of the star-fish and drill, which are estimated to destroy several hundred thousand dollars' worth of oysters every year. The operations were mainly confined to studies of the temperatures and densities of the water on the oyster-beds upon which these pests thrive, and of the inhabitants of the bottom, with a view of ascertaining the conditions of their existence. It is an interesting fact that the star-fish cannot live in fresh water, nor in water that does not contain a considerable quantity of salt. For this reason, no star-fishes infest the oyster-beds of Chesapeake Bay.

In the early spring of 1886 one of the greatest freshets ever known occurred in Rhode Island. Several inches of snow was on the ground, and beneath this a thick sheet of solid ice. The rain descended as though the flood had come again, carried off the snow, and then, instead of being partially absorbed by the ground, the water all ran down into the streams, converting every one of them into resistless torrents, before which neither dwellings, nor factories, nor bridges, nor railroad-embankments could stand. This immense volume of water all finally found its way into Providence River and Narragansett Bay, and it freshened the water to such an extent that all of the star-fishes perished. In 1887 there were plenty of little star-fishes, but they were too small to do any harm; but this year they are about as destructive as usual.

This examination was not carried as far as was desired, on account of a lack of funds. The people of Connecticut and Rhode Island, interested in the oyster-fisheries, were very anxious to have a thorough investigation made, and Senator Platt introduced a bill to pay the expenses of it. The bill was not passed, and the expedition last summer was paid for out of the regular funds of the Fish Commission. The investigation will be resumed next summer. No practical method of exterminating the star-fish pest has yet been suggested, except the one now practised of dredging them up, which is enormously expensive.

Among the most interesting and important divisions of the scientific work of the Fish Commission during the past season has been the exploration of the interior rivers and lakes of the country for the purpose of ascertaining what indigenous fishes they contain, and obtaining a knowledge of their physical characteristics. Indeed, this work had a twofold object. Besides that already explained, it was desirable to determine the adaptability of these rivers and lakes to the introduction of new fishes of economic value. Illustrative of the importance of this branch of the work, it may be said that requests are frequently received at the Fish Commission office that a certain river or lake be stocked with a particular kind of fish. It cannot be decided whether it will be safe to introduce the fish indicated until it is known what the present inhabitants of the stream or lake are, and whether its physical characteristics are favorable or not. It is useless, of course, to put young and tame fishes into water already inhabited by wild, fierce, predaceous fishes.

The greater part of this work has been conducted under the direction of Pres. David S. Jordan, of the University of Indiana, and one of the most distinguished ichthyologists in the country. His zeal and that of his assistants was not dampened by the fact that they were volunteers, serving without compensation beyond their actual expenses. There are scores of college professors and students advanced in science, who are ambitious to spend the months of their summer vacation in the field, making original investigations. To a majority of such the saving of their expenses is a matter of considerable importance, while the Fish Commission secures the services of men whom it could not afford to hire. The attractiveness of the scientific work of the government, on account of the superior advantages which it offers to those who desire to become specialists, is shown by the eagerness with which positions to which very small salaries are attached, in the United States Geological Survey, are sought, and also by the fact that positions in the National Museum are sought by hundreds of college graduates who are willing to work for salaries that are barely sufficient to pay their board.

President Jordan spent the entire summer in the field with his parties, personally devoting himself mainly to the rivers of Virginia, eastern Tennessee, North Carolina, and parts of South Carolina and Indiana. In North Carolina he found a virgin field of exploration in which he had had no predecessor, and a very interesting one it proved to be. Prof. C. H. Gilbert and Dr. J. A. Henshall of Cincinnati carried on a similar kind of work on the Ohio and other rivers of the Ohio valley, and Mr. C. H. Bollman of Indiana was detailed to accompany the party of Michigan explorers sent out by the Fish Commission of that State. Collections and information of the same kind are expected from Illinois, where the naturalists employed by the State were greatly aided by the use of the fish-commission cars, and in return agreed to give to the latter the results of their observations. The relations between the United States Fish Commission and the various State commissions are very cordial, and they are in many ways helpful to each other.

The schooner 'Grampus' went to the early-mackerel fishing-grounds in the spring for the purpose of observing the arrival of the first shoals of mackerel, and watching their movements as they went north along the coast, and especially the physical changes of the water accompanying those movements. Very important results were obtained. In a general way it may be said that the late arrival of the mackerel last spring was coincident with the lateness in the season, that the temperature of the water remained low, and that the mackerel-food obtained by the use of the towing-net at the surface was less abundant than usual. Observations of the habits of the mackerel were made by the 'Grampus' at intervals throughout the season and as late as the middle of October. These extended from the coast of Maine to Cape Hatteras.

For many years the temperatures of the waters have been recorded by employees of the Lighthouse Board and the Signal Service

at prominent points along both the Atlantic and Pacific coasts, and on the principal rivers and the Great Lakes. The results of these observations are now being plotted graphically upon charts by the Fish Commission, and will be published in an early report. It is expected that they will prove of great importance in explaining the distribution and movements of the fishes.

Altogether the result of the Fish Commission's work has been very satisfactory. Much of the scientific study and digestion of material collected during the summer, of course, still remains to be done, and this will be pushed forward in Washington during the months when, as a rule, field-work is impracticable.

MENTAL SCIENCE.

Notes on Hypnotism.

The Paris and Nancy Schools of Hypnotism. — Dr. Bernheim, the leader of the Nancy school, whose classic work we are soon to have in English, contributes to the *Revue de l'Hypnotisme*, May, 1888, a platform of beliefs. These can be summarized as follows: 1. They do not obtain Charcot's three phases— lethargy, catalepsy, and somnambulism — by any physical manipulation; nor do they find, as Charcot claims, that opening the eyes or rubbing the vertex will cause the patient to pass from one of these stages to another. They do not get the phenomena of *transfert* (of an affection of one side of the body passing to the other) nor the localization of function by pressing different portions of the cranium, nor any purely physiological result. On the other hand, they easily get all these results by a slight suggestion. If the subject has heard of or witnessed the expected results, it is sufficient. Again: the unconsciousness of lethargy is apparent only, the subject being open to suggestions at any stage. 2. *In hysteria magna* the hypnotic phenomena are the same as in normal subjects, the three stages, etc., being equally illusory. 3. Hysterical subjects are not good for the study of hypnotism. They introduce neurotic and other foreign symptoms, and vitiate the purity of the results. 4. The hypnotic state is not a neurotic one. The phenomena are natural, are of a psychological origin, and can be developed from natural sleep. 5. Neurotic patients are not more ready subjects than others, the wards of hospitals representing all types of diseases, furnishing an equal number of good subjects. 6. Not all subjects are purely automata played upon by the operator: more or less resistance is frequent, and the individuality partially remains. 7. All methods of hypnotization depend upon suggestion. Physical methods, especially hypnogenetic zones, do not exist except as the results of suggestion. 8. Suggestion is the key to *all* the phenomena, and careful study with new subjects will prove it so. Moreover, the large percentage (eighty) of subjects among normal persons found at Nancy is not due to a mental contagion, but to a skill in applying the suggestion. This position is rapidly gaining adherence above that of Charcot and the Paris school, which it opposes on all the above points.

A New Hypnotic Phenomenon. — M. Liegois contributes to the August number of the same periodical an article describing a new hypnotic phenomenon, in the field of a 'negative hallucination.' This term describes a state in which the suggestion that a certain person, a certain object in the field of vision, remains unseen, has been obeyed. The state is explained as an annihilation of the perception as it reaches consciousness. The impression is received, but ignored. Having a third party to suggest to one of his subjects that he will be invisible to her, it is found that she does not hear him, see him, or even feel the prick of a pin when he holds the pin, re-acting normally to all other persons. If, however, M. Liegois calls out impersonally, "Camille feels thirsty, Camille will drink a glass of water," she hears and obeys the command; if similarly told to stand at his side, she does so; and so on for every sense. While she does not hear him, she none the less really can hear him. There is a sort of dual personality, one half of which obeys the negative suggestion, while the other is automatically regulated, and obeys any suggestion not directly in conflict with a previous one. The further development of this study promises interesting results.

Hygienic Aspects of Hypnotism. — Upon the hygienic side we find the discussion of the prohibition of public hypnotic performances. The Academy of Medicine of Belgium held a long discussion upon the question, and finally voted to recommend a law abolishing it. The chief advocate in favor of the exhibitions was M. Delboeuf. Belgium thus follows the action of Austria, Italy, Denmark, Germany, and most of the Swiss cantons. The people have been strongly impressed with the dangers of an unskilled use of hypnotism, and a healthy sentiment to have it restricted to experts prevails. At the last session of the French Association for the Advancement of Science, M. Berillon introduced a similar measure, and it was voted as the sentiment of the section of hygiene and public medicine that all public exhibitions of hypnotism should be legally prohibited in France.

Miscellaneous. — Considerable space is taken up in the same periodical with the discussion of phenomena whose genuineness is not recognized, particularly with Dr. Luy's experiments upon the action of drugs at a distance. A committee of the Academy of Medicine was appointed to examine the correctness of Dr. Luy's conclusions, and they find unconscious suggestion to be at the basis of it all. When the contents of the vials containing the drugs were unknown to those present, the subject also failed to be appropriately affected by them. So, again, these pretended mysteries fall to the ground, and exemplify the pitfalls of the subject as well as the uncritical nature of methods often adopted by eminent scientists. Mention should also be made of the fact that the Church has recently entered into relations with hypnotism by a letter from the Bishop of Madrid, warning his brethren against the evils of the new movement, and placing it in line with the forbidden treatment of miracles.

Abnormal Sense-Perceptions.

Sound-Blindness. — Recent observations have emphasized the fact that many persons are defective in the distinctness of their perceptions, while others form peculiar links between perceptions of different senses. An illustration of the former is what has been rather falsely termed 'sound-blindness.' This condition refers to the defective hearing of sounds; so that, in the same way as the color-blind fail to distinguish between to us utterly distinct impressions, the sound-blind fail to make distinctions perfectly evident to ordinary ears. A Boston lady, Sara E. Wiltse, has recently tested the powers of Boston school-children in this direction (*American Journal of Psychology*, No. 4). Standing on the teacher's platform, she repeated the following words as distinctly as possible to 259 boys of the Latin School, aged from twelve to twenty years: 'ultramarine,' 'altruistic,' 'frustrate,' 'ultimatum,' 'ululate,' 'Alcibiades,' 'unaugmented.' The words were repeated as often as required, some as often as five times, and ample time was given for the writing of the words. 84 of the boys made mistakes in the vowel-sounds, such as 'ultruistic,' 'frostrate,' 'altimatum,' 'elulate,' 'olulate,' 'alulate,' 'unolmented.' That these 84 were really defective, was shown by the further test, in which the following words were read to them but once; viz., 'fan,' 'log,' 'long,' 'pen,' 'dog,' 'pod,' 'land,' 'few,' 'cat:' for only 4 of the 84 spelled these monosyllables correctly. For 'fan,' there appeared 'than,' 'thank,' 'fanned,' 'clam,' 'thang,' and 'fam;' for 'log,' 'glove,' 'clog,' 'lug,' 'love,' 'land,' 'long,' 'knob;' for 'long,' 'lung,' 'lown,' 'lone,' 'lawn,' 'land,' 'log,' 'loud,' 'lamp;' for 'pen,' 'penned,' 'pan,' 'paint,' 'hen,' 'ten;' for 'dog,' 'dove,' 'dug,' 'dot;' for 'pod,' 'hour,' 'heart,' 'hog,' 'hod,' 'hard,' 'fod,' 'thod,' 'fog,' 'bog,' 'pug,' 'part,' 'plot,' 'pard,' 'long,' 'bog;' for 'land,' 'lamb,' 'lend,' 'lamp,' 'lambed,' 'blend,' 'hen,' 'can;' for 'few,' 'frew,' 'fuse,' 'pew,' 'pen.' 'Cat' was correctly understood in every case. Of the 80, only 2 were found to be hard of hearing, suggesting that the others were more or less 'sound-blind.' So, again, of 223 boys of the English High School at Boston, 105 misspelled one or more of the polysyllables. In the Comins Grammar School, where the pupils were between the ages of eight and fourteen, only 34 of the 530 spelled all the monosyllables correctly. These pupils were tested under good conditions, and five were found to be deaf to the sound of a tuning-fork, though the teacher was unaware of the defect. For 'fan,' 7 different words and 2 blanks were given (a blank indicating an entire failure to understand the word), the total number of mishearings being 17; for 'log,' 17 different words and 10 blanks, involving 86 mishearings, the word being understood as 'love' 65 times; for 'long,' 14 words and 11 blanks, with 22 errors; for 'pen,' 18 words and 12 blanks, with 135 errors, of which 48 made the word 'hen,'

and 47 'pan;' for 'dog,' 6 words and 1 blank, with 10 errors; for 'pod,' 51 words and 64 blanks, with 270 errors, of which 'hog' is responsible for 85, 'hod' for 36, 'pog' for 26, 'hard' for 25; for 'land,' 14 words and 12 blanks, with 63 errors, the word being written 'lamb' 42 times; for 'few,' 11 words and 10 blanks, with 15 errors; for 'cat,' 5 words, no blanks, and 5 errors. Of course, these errors may be due to defects elsewhere than in the power of sound-discrimination, e.g., in the power of translating auditory into visual symbols; but the variety and nature of the errors are certainly interesting. If we classify the nature of the confusions, we find that in the vowel-sounds, *a*, as in 'fan' and 'cat,' is most apt to be heard as *a* long 8 of 16 times; that the *e* of 'pen' is heard as a short *a* 69 of 84 times; the *o* of 'dog,' 'log,' 'long,' 'pod,' as a short *u* 83 of 132 times; while the *ew* of 'few' is about equally often regarded as various other sounds. With regard to consonants, *d*, as in 'dog,' 'pod,' becomes hard *g* 132 of 199 times; the *g* of 'dog' becomes *v* 67 of 82 times; the *p* of 'pen,' etc., becomes *h* 240 of 278 times; the *n* of 'pen,' etc., becomes *m* 56 of 78 times; the *ng* of 'long' becomes *n* 7 of 15 times; while *h*, *t*, and hard *c* have no sounds with which they are specially confused. These facts should be of some importance to philologists, and will perhaps agree with the laws of language and dialect transformations.

Color and Taste. — The peculiar association of a color with a sound by which a certain sound will at once vividly arouse a definite color, is quite normal, and has of recent years been frequently described. The association of color with smells is a much rarer phenomenon, and of color with tastes perhaps rarer still. Dr. Férè gives an account of a woman, who, after taking vinegar, saw every thing red for a few minutes, and then every thing as bright green for more than an hour. Dr. Férè explains this as due to a similarity in the subsidiary emotional effects accompanying the sensation.

HEALTH MATTERS.

Use of Tobacco.

C. W. LYMAN, in a communication to the *New York Medical Journal*, discusses in a very entertaining way, tobacco, its use and abuse. Tobacco, he says, contains an acrid, dark-brown oil, an alkaloid, nicotine, and another substance called nicotianine, in which exist its odorous and volatile principles. This description of the active principles of tobacco is of importance to smokers; for, when tobacco is burned, a new set of substances is produced, some of which are less harmful than the nicotine, and are more agreeable in effect, and much of the acrid oil — a substance quite as irritating and poisonous as nicotine — is carried off. These fire-produced substances are called, from their origin, the 'pyridine series.' By great heat the more aromatic and less harmful members of the series are produced, but the more poisonous compounds are generated by the slow combustion of damp tobacco. This oil which is liberated by combustion is bad both in flavor and in effect, and it is better, even for the immediate pleasure of the smoker, that it should be excluded altogether from his mouth and air-passages.

Smoking in a stub of a pipe is particularly injurious, for the reason that in it the oil is stored in a condensed form, and the smoke is therefore highly charged with the oil. Sucking or chewing the stub of a cigar that one is smoking is a serious mistake, because the nicotine in the unburned tobacco dissolves freely in the saliva, and is absorbed. 'Chewing' is on this account the most injurious form of the tobacco habit, and the use of a cigar-holder is an improvement on the custom of holding the cigar between the teeth. Cigarettes are responsible for a great amount of mischief, not because the smoke from the paper has any particularly evil effect, but because smokers — and they are often boys or very young men — are apt to use them continuously or at frequent intervals, believing that their power for evil is insignificant. Thus the nerves are under the constant influence of the drug, and much injury to the system results. Moreover, the cigarette-smoker uses a very considerable amount of tobacco during the course of a day. 'Dipping' and 'snuffing' are semi-barbarities which need not be discussed. Not much effect is obtained from the use of the drug in these varieties of the habit.

Nicotine is one of the most powerful of the 'nerve-poisons' known. Its virulence is compared to that of prussic acid. If birds be made to inhale its vapor in amounts too small to be measured, they are almost instantly killed. It seems to destroy life, not by attacking a few, but all of the functions essential to it, beginning at the centre, the heart. A significant indication of this is that there is no substance known which can counteract its effects: the system either succumbs or survives. Its depressing action on the heart is by far the most noticeable and noteworthy symptom of nicotine-poisoning. The frequent existence of what is known as 'smoker's heart' in men whose health is in no other respect disturbed is due to this fact.

Those who can use tobacco without immediate injury will have all the pleasant effects reversed, and will suffer from the symptoms of poisoning if they exceed the limits of tolerance. These symptoms are: 1. The heart's action becomes more rapid when tobacco is used; 2. Palpitation, pain, or unusual sensations in the heart; 3. There is no appetite in the morning, the tongue is coated, delicate flavors are not appreciated, and acid dyspepsia occurs after eating; 4. Soreness of the mouth and throat, or nasal catarrh, appears, and becomes very troublesome; 5. The eyesight becomes poor, but improves when the habit is abandoned; 6. A desire, often a craving, for liquor or some other stimulant, is experienced.

In an experimental observation of thirty-eight boys of all classes of society, and of average health, who had been using tobacco for periods ranging from two months to two years, twenty-seven showed severe injury to the constitution and insufficient growth; thirty-two showed the existence of irregularity of the heart's action, disordered stomachs, cough, and a craving for alcohol; thirteen had intermittency of the pulse; and one had consumption. After they had abandoned the use of tobacco, within six months' time one-half were free from all their former symptoms, and the remainder had recovered by the end of the year.

A great majority of men go far beyond what may be called the temperate use of tobacco, and evidences of injury are easily found. It is only necessary to have some record of what the general health was previous to the taking-up of the habit, and to have observation cover a long enough time. The history of tobacco in the island of New Zealand furnishes a quite suggestive illustration for our purpose, and one on a large scale. When Europeans first visited New Zealand, they found in the native Maoris the most finely developed and powerful men of any of the tribes inhabiting the islands of the Pacific. Since the introduction of tobacco, for which the Maoris developed a passionate liking, they have from this cause alone, it is said, become decimated in numbers, and at the same time reduced in stature and in physical well-being so as to be an altogether inferior type of men.

ELECTRICAL SCIENCE.

Some New Tests of Secondary Batteries.

IN the last two years the improvements in storage-batteries have been such as to indicate the near approach of the time when they can be economically used for street-car work. Indeed, it is now a question whether, under favorable conditions, they cannot advantageously replace horses; and the result of the experiments on the Fourth Avenue Road in New York, where ten storage-cars will soon be regularly operated, will be awaited with interest.

Dr. A. von Waltenhofen, in the *Centralblatt für Electrotechnik*, gives the results of some interesting experiments on the Farbaky-Schenck accumulators that have a direct bearing on the subject of electric traction. But before giving the results, it is well to call to mind the points in which the present storage-cells are lacking. The principal point is in the small discharge-rate, necessitating a large number of cells being carried by each car (from 3,200 to 4,500 pounds), a corresponding increase in the weight of the car itself to give the strength necessary to sustain this increased weight, a larger outlay for battery and a corresponding depreciation, a greater power to move the greater weight, and the necessity of re-laying much of the track now in use with heavier rails and a better roadbed. For instance: the weight of an ordinary 16-foot car is from 6,000 to 7,000 pounds. Equipped with motors and storage-battery, the weight is about 13,000 pounds. A car equipped with this weight of battery can be run for from 45 to 60 miles, depending on the conditions of the track and the type of equipment.

Now, what is wanted is a cell with, say, the same storage-capacity and weight, — even with the same rate of depreciation, — but which has a normal rate of discharge and charge of four or five times that of the present type. We could then use from 1,000 to 1,500 pounds of battery on a car, — enough to make one or two round trips, — reduce the total weight of the car to 9,000 pounds, decrease the investment and cost of renewal three or four times, and allow the present car bodies and tracks to be used without any considerable alteration. Under these circumstances (and there is no doubt the conditions will be sooner or later attained), street-car traction by secondary batteries would be an assured and immediate success for any ordinary condition of grade.

Dr. von Waltenhofen's experiments are of interest in this connection, because of the very rapid discharges to which he subjected the Farbaky-Schenck cell, with apparently excellent results as to efficiency and freedom from harmful effects. The cell in question had seven positive and six negative plates, weighing 47 pounds, the total weight of the cell being about 60 pounds. It was constructed with a view to discharging it at 100 ampères, — five times the normal rate. The plates of this type of storage-cell have been described in this journal. They are of a modified 'grid' form, the holes being filled with a mixture of red lead and coke, or other porous material, moistened with sulphuric acid.

The cell was first completely charged, and then discharged at a rate of 100 ampères, until the potential difference at the terminals fell from 1.87 to 1.78 volts. The capacity was 166 ampère hours. Then the cell was charged at 20 ampères, and discharged at 100 ampères as before, but only 100 ampère hours were put in. 88 ampère hours were returned, giving an efficiency in ampère hours of 88 per cent. In total energy the efficiency was 77 per cent. It is evident, however, that these figures are much higher than would be obtained if the cell was fully charged. In another experiment the discharge-rate was increased to 200 ampères, the cell was charged with 200 ampère hours, and the output was about 130 ampère hours, — a current efficiency of 65 per cent, with a total efficiency of from 45 to 50 per cent. It is stated that neither of these discharges injured the cell in any way. A current of 300 ampères was then tried, and the cell kept up its potential difference reasonably well for about fifteen minutes. As to the effect the author says, "Whether this great over-exertion has been injurious to the accumulator, Messrs. Farbaky and Schenck do not state; but our experiments have shown that the cell can be discharged without injury at 200 ampères."

The author compares the performance of several types of cells, from which we get the following data: —

Farbaky and Schenck. — Capacity per pound of plate, 3.5 ampère hours; discharge-rate per pound, 2.1 ampères; total efficiency, 77 per cent (?).

Reckenzaun. — Capacity per pound of plate, 4.1 ampère hours; discharge-rate per pound, .37 of an ampère; total efficiency, 81 per cent.

Julien. — Capacity per pound of plate, 4.2 ampère hours; discharge-rate per pound, .42 of an ampère; total efficiency, 83.5 per cent.

Tudor (*at a practical discharge-rate*). — Capacity per pound of plate, 1.3 ampère hours; discharge-rate per pound, .33 of an ampère; total efficiency, 68.6 per cent.

These figures of Dr. von Waltenhofen for the Farbaky-Schenck accumulator mark an advance, and an advance that is in the right direction; but it is greatly to be regretted that the most important fact that is brought forward, namely, that the cells are not injured by such high discharge-rates, rests on a bare assertion, and no figures are given to show that a number of such discharges extending over a considerable period have been attempted.

NEW METHOD OF PRODUCING ELECTRIC CURRENTS. — C. Braun, in the *Berichte der Berliner Akademie*, describes a new method of producing electric currents. A wire of nickel is twisted into a spiral, and the two ends are connected with the terminals of a sensitive galvanometer. When the spiral is suddenly pulled out, there is a deflection of the galvanometer; and, when it is compressed, there is a deflection in the opposite direction. The direction of the current in a connected wire is determined by the direction of the twist as looked at from the end to which the wire is connected. It is stated that the effects cannot be accounted for by induction. A heating or cooling of the wire as a whole produces the same effects. If the wire is annealed, it loses its power of giving a current, but regains it again on being stretched. The effect is not large enough in diamagnetic bodies to be observed with any certainty. It seems to exist in iron and steel, but other effects make the observations difficult. If these effects exist at all, and are not due to induction, they are probably caused by the different strains on the outside and inside of a spire of the wire. It is stated that if the wire be magnetized the effect is greatly augmented.

SOME CURIOUS INCANDESCENT LAMP PHENOMENA. — The *Electrical World* publishes a letter from F. J. Crouch describing some curious effects obtained with incandescent lamps, both of whose terminals were joined to the circuit of an alternating-current dynamo. The circuit of the dynamo is made through a resistance of about 2,000 ohms (the electro-motive force is not stated). To the leads on one side of the resistance are attached both terminals of some Bernstein incandescent lamps, whose bulbs are immersed in tumblers of salt water. From the other side of the resistance, and therefore at a potential differing greatly from that of the lamps, wires are brought to the tumblers and dipped in the water. "Now, when the dynamo is started, the light appears, and the light-waves pass through the glass." The light is described as "similar to that of the glow-worm or firefly. With three Bernstein lamps, I obtained a beautiful moonlight effect, sufficient to read by in a large room." Another interesting phenomenon has been brought out in a series of letters to the same paper. It is found that incandescent lamps in the vicinity of belts or apparatus giving considerable statical discharges have a very short life. The writer has tried a few experiments to verify this. On holding near a Weston lamp (110 volts) the end of a wire connected with a Holtz machine, if the lamp be burning and the machine is turned rapidly, the filament will break in from one to five minutes. In the first lamp experimented on there was a very marked vibration of the filament, being more violent when the negative pole of the Holtz machine was presented. This lasted for perhaps a minute, when the filament broke. Some other lamps were experimented on in which there was no vibration of the filament that could be noticed; still they broke in a short time. The effect is of some practical importance in paper and other mills, and the life of the lamps can be greatly increased by putting over the bulb a wire netting connected with the earth. If the net be made of polished wire, — German silver, for instance, — there will be little or no loss of light.

BOOK-REVIEWS.

Literature in School. By HORACE E. SCUDDER. Boston and New York, Houghton, Mifflin, & Co. 16°. 15 cents.

OF the many reforms now being urged in school matters, one of the most commendable, and one which appeals to the best sense of the community, is that which urges the replacing of the literary mess now offered to the child in the usual school-reader by works of literature which have won for themselves a place. In this movement Mr. Horace E. Scudder of Cambridge has taken and is taking a leading part. Not only has he written forcibly and well on the subject, but he has himself prepared various editions of standard works fit for use in the school-room. In the present pamphlet Mr. Scudder prints his address on the subject of 'Literature in Common-School Education,' read before the National Education Association at its meeting in San Francisco in July last, and his two papers on 'Nursery Classics' and 'American Classics' respectively, which have recently appeared in the *Atlantic Monthly*. Mr. Scudder points out that literature has a field and an office of its own, and, unless it is recognized in the school, the place which it should take must remain unfilled. Literature gives expression to the spiritual and non-material wants of man, and must be brought into the foreground to counterbalance the tyranny of materialism, which bids fair, unless checked, to increase year by year. Mr. Scudder does not mean by the reading of literature in school the critical study of great authors. To urge that, would be to place a weapon in the hands of his opponents; but he says (p. 31), "The place, then, of literature in our common-school education, is in

spiritualizing life, letting light into the mind, inspiring and feeding the higher forces of human nature. In this view, the reading-book becomes vastly more than a mere drill-book in elocution; and it becomes of the greatest consequence that it should be rigorously shut up to the best, and not made the idle vehicle of the second best. It must never be forgotten that the days of a child's life are precious: it has no choice within the walls of the school-room. In its hours for reading it must take what we give it. Be sure that the standard which we set in our school reading-books will inevitably affect its choice of reading out of school; that the conceptions which it forms of literature and the ideal life will be noble or ignoble, according as we use our opportunities. It is for us to say whether the American child shall be brought up to have its rightful share in the great inheritance of America."

In the second essay, after pointing out the desirability of teaching nursery classics in school, the author says (p. 41), "The drawback to the use of these nursery classics in the school-room has been in the absence of versions which are intelligible to children of the proper age, reading by themselves. The makers of the graded reading-books have expended all their ingenuity in *grading* the ascent. They have been so concerned about the gradual enlargement of their vocabularies, that they have paid slight attention to the ideas which the words were intended to convey. But just this gradation may be secured through the use of these stories, and it only needs that they should be written out in a form as simple, especially as regards the order of words, as that which obtains in the reading-books of equivalent grade." And this fine passage serves more purposes than one to show why American classics should be read in school: "The common-school system is the one vast organization of the country, elastic, adapted in minor details to local needs, but swayed by one general plan; feeling the force of educated public sentiment, and manipulated by the free, intelligent association of teachers and superintendents. This organization affords the most admirable means for the cultivation and strengthening of the sentiment of patriotism, and it avails itself of it in many ways." We are perfectly safe in taking Mr. Scudder for our guide in the matter of literature in the schools.

Children's Stories of the Great Scientists. By HENRIETTA CHRISTIAN WRIGHT. New York, Scribner. 8°. $1.25.

THE present volume, which is accompanied by eight good engravings, — portraits of some scientists, — describes the life and work of a number of the most energetic and successful workers in natural science, the author's object being evidently to bring out the lesson taught by their lives, more than to state the results of each one's labor; at least, such we should consider the prime object of biographies of scientists intended for children. In some instances the author has well succeeded in bringing out the instructive part of the lives of these men, and these we consider the best stories contained in the book; but in others a mere compilation of events and discoveries is given, while the character and importance of the man cannot be understood from the description. Among this latter class is, for instance, the chapter on Alexander von Humboldt. Many of the discoveries of physicists as described in the book will hardly be intelligible to children, as they deal with the most difficult problems of science. As an introduction into the history of natural science, the book has, however, a certain merit. The seventeen men whose lives and works are described are the most prominent of the last centuries; and whenever the author pays attention to their struggles and sufferings for the sake of their science, as is done in many cases, the descriptions are suggestive and instructive to the child.

Our Celestial Home. By J. G. PORTER. New York, A. D. F. Randolph & Co. 16°. $1.

THIS book is written by an astronomer, and is an attempt to prove that heaven is somewhere in the stellar universe, though the author is careful not to say where. He contends, that, according to the Bible, heaven is a material place, and not merely a happy state of existence, and must therefore be somewhere in the universe that we see around us. He gives a chapter to the subject of the immensity of the universe as made known by the telescope, and then considers the question of its stability. Science, he thinks, has shown the universe to be stable as to motion, but speaks with some hesitation with regard to the forces of heat and light. The earth, he intimates, may one day be destroyed by conflagration caused by collision with some swarm of meteors, thus fulfilling the prediction of scripture. Professor Porter is wholly uncritical in his religious views; for he believes not only in the future destruction of the earth, but also in the literal resurrection of the body, in the doctrine that death is the result of Adam's fall, and much else that liberal Christians of the present day have discarded. Indeed, his book is neither religious nor scientific in the higher sense of these terms, and is not likely to make any impression on intelligent minds.

Soaps and Candles. Ed. by J. CAMERON. Philadelphia, Blakiston. 12°. $2.25.

THIS little book is one of a series of technical handbooks, of which those already published are on 'Brewing, Distilling, and Wine-Manufacture;' 'Bleaching, Dyeing, and Calico Printing;' 'Acetic Acid and Vinegar, Ammonia and Alum;' and 'Oils and Varnishes.' As in the preceding numbers of the series, the articles in 'Cooley's Cyclopædia' have formed the nucleus to which material has been added from various scattered sources. It is assumed that the reader has some knowledge of chemistry.

Examples in Physics. By D. E. JONES. London and New York, Macmillan. 16°. 90 cents.

AS the author well remarks, "it is quite common to find students who have a correct knowledge of the general principles of physics, and can apply it intelligently in making a physical measurement, but who are yet unable to solve an easy problem or to calculate the results of their experimental work." Every one who has been brought face to face with some numerical example in the course of his study of physics has had cause to regret that he has not had more practice in such work, and it is just this opportunity for practice that 'Examples in Physics' is intended to supply in its more than one thousand problems.

NOTES AND NEWS.

THE National Geographic Society signalized the beginning of the second year of its successful work by publishing almost simultaneously with its first meeting of the season Vol. I., No. 1, of *The National Geographic Magazine.* In outward appearance it is as attractive as its contents are creditable to the society, by which it is not only edited, but written. Its outward covering is of the, at present, fashionable brick-color, upon which is printed in plain type the title of the magazine, the seal of the society, and the place of publication. The paper is of good quality, and the typography clean and sharp, so the page is easily read. But the contents are most deserving of praise. Besides the opening announcement, introductory address by the president, proceedings of the National Geographic Society, and facts relating to it, there are six carefully prepared articles. Their titles are, 'Geographic Methods in Geologic Investigation,' by William M. Davis; 'Classification of Geographic Forms by Genesis,' by W. J. McGee; 'The Great Storm of March 11 to 14, 1888,' — two articles, the first a brief one, by Gen. A. W. Greely, and the second a very elaborate study of its entire history, by Everett Hayden. The latter paper is illustrated by six carefully prepared colored charts, upon which is shown graphically almost every known fact relating to this great storm. This paper, with the charts, has also been reprinted in a pamphlet. The two remaining papers are, 'The Survey of the Coast,' by Herbert G. Ogden; and 'The Survey and Map of Massachusetts,' by Henry Gannett. In the introductory announcement the editors say: "The National Geographic Society has been organized 'to increase and diffuse geographic knowledge,' and the publication of a magazine has been determined upon as one means of accomplishing these purposes. It will contain memoirs, essays, notes, correspondence, reviews, etc., relating to geographic matters. As it is not intended to be simply the organ of the society, its pages will be open to all persons interested in geography, in the hope that it may become a channel of intercommunication, stimulate geographic investigation, and prove an acceptable medium for the publication of results. The magazine is to be edited by the society. At present it will be

issued at irregular intervals; but, as the sources of information are increased, the numbers will appear periodically. The national capital seems to be the natural and appropriate place for an association of this character, and the aim of the founders has been, therefore, to form a national rather than a local society. As it is hoped to diffuse as well as to increase knowledge, due prominence will be given to the educational aspect of geographic matters, and efforts will be made to stimulate an interest in original sources of information. In addition to organizing, holding regular fortnightly meetings for presenting scientific and popular communications, and entering upon the publication of a magazine, considerable progress has been made in the preparation of a physical atlas of the United States. The society was organized in January, 1888, under the laws of the District of Columbia, and has at present an active membership of about two hundred persons. But there is no limitation to the number of members, and it will welcome both leaders and followers in geographic science, in order to better accomplish the objects of its organization."

— Lieut. Robert Platt, U.S.N., has been ordered from the Washington Navy-Yard to command the United States Fish Commission steamer 'Fish Hawk.'

— As the stormy season on the North Atlantic approaches, the Hydrographic Office at Washington again reminds navigators, in a note on the November Pilot Chart, of the great advantage to be derived from the use of oil to prevent heavy seas from breaking on board. The forcing of the attention of mariners to this subject, so that now no careful master of a vessel goes to sea without providing for the use of oil in storms, has been one of the most important results of the work of the Hydrographic Office.

— Prof. Harry King of the Geological Survey has returned to Washington from Clark County, where he has been roughing it, much improved in health.

— In the summary of Mr. J. W. Osborne's paper on 'Substances Feebly Sensitive to Light,' which appeared in *Science* of Oct. 26, the fact that it was read before the Washington Philosophical Society was accidentally omitted. In the same issue, by some slip of the pen or types, Mr. J. B. Smith was represented as saying that he had captured and identified *four* distinct species of June-bugs in the District of Columbia. The number was really twenty.

— The titles of the papers read at the meeting of the Biological Society of Washington, Nov. 3, were, 'Fossil Wood and Lignites of the Potomac Formation,' by Mr. F. H. Knowlton; 'Observations on the Modifications of the Gill in Univalve Mollusks,' by W. H. Dall; 'Characteristics of the *Scatophagidæ*,' by Dr. Theo. Gill; 'Description of a New Species of *Arvicola* from the Black Hills of Dakota,' by Dr. C. Hart Merriam. Some notice of the first of these papers will be given in a future number of *Science*, if space permits.

— At the second meeting for the season of the National Geographic Society at Washington, Nov. 2, the paper of the evening was presented by Mr. Marcus Baker, on 'Classification of Surveys.' *Science* hopes to give an abstract of this paper in an early issue.

— The Australasian Association for the Advancement of Science held its first meeting in August of this year. The formation of the association was first suggested by Professor Liversidge of the Sydney University, during the exhibition in Sydney in 1879; but, matters at that time not being considered quite ripe for it, the formation of the association was again brought forward through the press in the year 1884. It was then suggested that the first general meeting should be held in Sydney on the one hundredth anniversary of the foundation of the colony, as it was at that time thought there would be an international exhibition in Sydney to celebrate that event. In furtherance of the project, a preliminary meeting of delegates from various scientific societies was held in Sydney in 1886 (November), the project having thus early met with the approbation and support of the majority of the learned and scientific societies of Australasia. At this meeting the formation of the Australasian Association for the Advancement of Science was agreed to unanimously, the rules of the British Association being adopted until the first general meeting. In accordance with a resolution passed at the meeting of delegates, the election of officers for the year 1888 took place in Sydney in March of the present year: Mr. H. C. Russell, B.A., F.R.S., government astronomer of New South Wales, being elected president; Sir Edward Strickland, K.C.B., F.R.G.S., honorary treasurer; and Professor Liversidge, M.A., F.R.S., and Dr. George Bennett, F.L.S., honorary secretaries. The formation of the general council was afterwards proceeded with, each society electing one representative for every hundred of its members. Practically every society coming within the scope of the association has one or more representatives on the general council. The association is thoroughly Australasian in its character and members, and the succeeding general meetings are to take place in turn in the capitals of the other colonies, the executive officers being elected year by year by the colony in which the meeting is held. It has been decided, however, that Sydney shall be the permanent headquarters of the association, and that Professor Liversidge shall be the permanent honorary secretary. The first general meeting was held at the Sydney University, the opening ceremony taking place on Tuesday evening, Aug. 28, when the presidential address was delivered. On the following day the sectional meetings commenced; and all the sections, with one exception, brought their proceedings to a close with the end of the week. About a hundred and ten papers were sent in by gentlemen of distinction in the various branches of science, literature, and art in the different colonies, and a considerable number of the papers are to be published in full in the first volume, soon to be issued by the association. It may therefore be anticipated that the work done by the association during the first year of its existence is of a highly important and useful character. The more solid work of the meeting was lightened by excursions to various places of interest to geologists, botanists, and others, and every effort was made to provide for the entertainment and comfort of visiting members, numerous entertainments being given by leading citizens. It has been decided that the next meeting shall be held in Melbourne, and Baron Sir Ferdinand von Mueller, the government botanist of Victoria, is the president-elect for the year. In 1890 the association is to meet in New Zealand. The rules are practically the same as those of the British Association, and, at the time of the meeting, the new association numbered about 850 members. It is confidently anticipated that this number will be considerably augmented, if not actually doubled, by the time the next general meeting is held.

— "The learning peculiar to the pedagogue ofttimes brings the pedagogue to contempt." In the 'Second Lessons in Arithmetic' (Houghton, Mifflin, & Co.) we are glad to note that the object of the editor, Mr. H. N. Wheeler, has been to prepare a text-book which, by its method of developing the mind of the learner, by the emphasis that it places on fundamental principles, and by the omission of useless subjects and arithmetical terms known only in the school-room, will meet the wants of those teachers and businessmen throughout the United States who demand that the essentials of arithmetic shall be better taught than heretofore, and that the non-essentials shall be omitted. —— Mr. Walter Besant has written a biography of the author of the 'Gamekeeper at Home' and the 'Amateur Poacher;' and this 'Eulogy of Richard Jefferies' will be shortly published in New York by Longmans, Green, & Co. Mr. Besant has a sympathetic and tender touch, and his account of the struggles of unfortunate Jefferies is pathetic and affecting.

— The late Prof. Edward Tuckerman made a choice collection of books and papers relating to lichens, some four hundred numbers in all, which has been presented by Mrs. Tuckerman, in accordance with his own wish, to Amherst College Library. It is proposed to keep the collection by itself, under the name of the 'Tuckerman Memorial Library,' and to make it worthy of the name by making it as complete as possible in its own department. Supposing that some persons interested in this specialty might like to assist in maintaining and completing the collection (with the understanding that it is always available to public use), the librarian of Amherst College, William I. Fletcher, has issued a circular giving opportunity for any who care to do so to contribute, either in money or in material (especially rare monographs that may have escaped

Professor Tuckerman's notice), to this memorial to a model scholar and scientist. Whatever money may be contributed will be kept as a fund, of which only the income will be employed in making additions to the collection, or in repairs and rebinding. The sum of a thousand dollars would probably suffice as such a fund.

— An interesting incident of the statistics showing the social, sanitary, and economic condition of women employed in shops and factories of the United States, which are to be published in Col. Carroll D. Wright's annual report of the Bureau of Labor, is that they were collected by women who were employed as special agents of the bureau for that purpose. More than seventeen thousand women were interviewed.

— Prof. Aug. Kerckhoffs, of Dutch origin, but who has long been settled in Paris as a teacher of languages in a commercial school, will succeed the late Herr Johann Martin Schleyer as head of the Volapükists. Father Schleyer published his first book on Volapük in 1879, and nine years later, at the time of his death, a moderate estimate puts the number of his followers at not less than a quarter of a million persons. Professor Kerckhoffs is the most distinguished of his pupils.

— In *Science*, No. 300, p. 207, line 21, for '$\frac{1}{110}$' read '$\frac{1}{1100}$.'

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

On the Alleged Mongolian Affinities of the American Race: A Reply to Dr. Daniel G. Brinton.

A FEW days ago a paper of Dr. Daniel G. Brinton, entitled 'On the Alleged Affinities of the American Race' (*Science*, Sept. 14, 1888), came to my knowledge.

This paper, which purports to be a refutation of the asserted Mongolian affinities of the American natives, contains, in my estimation, such wrong interpretation of acknowledged facts, and such illogic argumentation, that, although I generally avoid discussions of this kind, I cannot help making an exception this time.

It would be worth while to examine and criticise thoroughly all the arguments brought forward in Dr. Brinton's paper, but a general review will sufficiently show the nature and value of Dr. Brinton's refutation.

Unfortunately, for the present I am compelled to discuss the matter in a rather incomplete way, as I am travelling, and do not have the necessary works at hand from which I should like to quote, in order to prove what I say. I have therefore to make all my statements and quotations from memory.

Let us examine now Dr. Brinton's arguments against the asserted Mongolian affinities of the native Americans, as existing in language, in culture, and in physical peculiarities.

First, as to language. In claiming that there is no linguistic connection between the American and Mongolian languages, which may be true, Dr. Brinton forgets that also in the (his) Mongolian race the various languages are far from showing any connection one with another, and yet he considers the peoples who speak these different languages as being of one race. Moreover, in the Caucasian and negro races of Blumenbach's classification, which Dr. Brinton seems to adopt, widely different languages, not showing the remotest linguistic connection, have been grouped together. For instance: the Basques, the Caucasians proper (of the Caucasus), the Semites, and numerous other groups of peoples, are considered to be of one race, the white or Caucasian. The African negroes, the Melanesians, the Negritos of the islands of south-eastern Asia, and the Australians, are equally regarded as forming another, the black or negro race. Although there is no linguistic affinity between the different groups just mentioned, they are affiliated by physical characteristics, and each forms respectively one great race. As long as we accept this, we have a perfect right to group the Ural-Altaic, and other Mongolian languages, with the native languages of America.

Second, as to culture. Although I am far from professing that ancient American culture has borrowed any thing from Europe, Asia, or Africa, neither do I positively deny the contrary until further evidence.

The science of archæology, as Dr. Brinton himself admits, only came into being at a comparatively recent date. If this be true of archæological science in general, it is more so of American archæology in particular, and we are consequently very far from having exhausted it. The different branches of ancient American culture, from the arid regions of the South-west to Peru, have not yet been studied systematically enough, and in connection with ethnology (as they should be), to permit us at present to draw any certain conclusions as to whether they contain any foreign elements, Mongolian or otherwise.

There is no need whatever as yet of hurrying Americanists, as Dr. Brinton wishes, to recognize the absolute autochthony of native American culture. The coming-forth of truth from studying a branch of science cannot, and never will, be forced: it *grows*, gradually and slowly, in the same proportion as our knowledge increases.

Third, as to physical peculiarities. Putting aside for the present linguistic and cultural affinities between Mongolians and native Americans, to deny that the American aboriginal belongs by his physical characteristics to the Mongoloids is equal to denying that the Basques and the Fins belong somatologically to the white race, or to claiming that the Hottentots and the Negritos do not form branches of the black race.

The comparative study of physical characteristics is perhaps the only satisfactory way of classifying the human races; and, although I cannot deny that any other classification, linguistic or sociologic, has its value and right of existence, we never ought to try to harmonize and to unite them, as is often done. As the different classifications have as many absolutely different points of view, their union can only lead to erroneous estimations. This illustrates, that, even admitting that the languages and cultures of the native American are not Mongoloid or Mongolian, nevertheless the physical peculiarities of these races may be the same.

Before I continue, let me state what I call, on purely somatological grounds, the Mongoloid race. Mongoloids, or Mongolians, in the widest sense, are, to me, a number of zoölogical varieties (*variété héréditaire*, in the sense of A. de Jussien) of the same subspecies or race, distributed promiscuously, and in different proportions (in the sense of Kollman's *penetratio*: see Kollman's studies on European and American anthropology, in *Archiv für Anthropologie* and *Zeitschrift für Ethnologie*), over parts of northern and eastern Europe, the greater portion of Asia, the Indian Archipelago, Polynesia, a part of Madagascar, and originally over the whole American continent with its numerous islands. The term 'Mongoloid,' as I understand it, is in the main synonymous with Oscar Peschel's '*Mongolenähnliche Völker*,' and with the '*races jaunes*' of French anthropologists.

The varieties of this great race differ somatologically much less among themselves than the varieties of the white and black races.

I will now consider, one by one, the arguments of Dr. Brinton against the racial relationship between Mongoloids and American natives.

First, as to color. Dr. Brinton forgets, that, in condemning Cuvier for the confusion of the American with the Mongolian race, because he based his racial scheme principally on the color of the skin, he equally condemns Blumenbach, whose division Dr. Brinton first calls 'eminently scientific.' We know that Blumenbach divided mankind into a white, yellow, brown, red, and black race, — a division at least just as much an '*a priori* hypothesis,' as it pleases Dr. Brinton to call Cuvier's divisions. Blumenbach had probably seen just as few pure Mongolians and American natives as Cuvier; otherwise he would not have called the Americans red. True 'redskins' do not exist. The American aboriginal is assuredly more yellow than red.

As far as my own observations among Indians go, in North and South America and in Mexico, and among Chinese, Japanese, and Malays, I have come to the conclusion that they all have the same color of skin, which we might best call yellowish brown, but in a great variety of shades, which often occur among the same people

or tribe, and depend upon age, sex, and general health. Exposure, mode of living, climate, and altitude are, furthermore, the main factors which determine the many different shades of the color of the skin, not only among the Mongoloids, but also among the white and black races.

Let us suppose for a moment that the color of a Mongolian were yellow, and that of an American red: would it ever occur to a modern anthropologist to classify them for this reason in a separate and distinct race?

There is no race in which both the color of the skin and the color of the hair vary more than in the white. Think of a blond, florid complexioned Teuton, and an Italian with raven-black hair and dark skin. And yet, on account of the rest of their physical characteristics, they belong to the same race.

After this, what Dr. Brinton said about the difference between the character and color of the hair of Mongolians and Americans needs no further refutation.

Although I have probably studied somatologically more American Indians, and have examined more of their skulls, than any other anthropologist living, as yet I hesitate to name "a positive cranial characteristic of the red race." At any rate, Dr. Brinton is mistaken in thinking that the *os Incæ* is found in its extreme development in the "American race," and in its greatest rarity among the Mongolians. What in the days of Von Tschudi seemed true, has been refuted since. As I write this without any books at my disposal, and simply quote from memory, I cannot now give any statistics of the relative frequency of this anomaly in different races, but would refer to Virchow's and my own investigations on this subject (VIRCHOW, *Ueber Merhmale niedrer Menschenracen am Schädel;* TEN KATE, *Craniologie der Mongoloiden*).

Although it is true that the glabella is more prominent in American skulls than in Altaic or northern Mongoloid crania, this is no argument to separate them racially from each other. The African negroes, for instance, seldom have a prominent glabella; the Australians, on the contrary, have, as a rule, an exceedingly strongly developed glabella; but nevertheless both African negroes and Australians are considered as belonging to the same race.

As far as the "Aymarian depression" is concerned, one might as well call all different artificial deformities of the skull, those in Europe included, racial characteristics. They are merely incidental, and belong as much to the domain of ethnology as to that of physical anthropology.[1]

It is not quite correct to assert, that, "of all the peoples of the world, the Mongols, especially the Turanian branch, are the most brachycephalic."

Many years ago, in the days when our craniologic knowledge was very limited, we had reason to believe this to be a fact; but since one armchair anthropologist copied this statement from the other, and since Aitken Meigs studied craniology after very imperfect methods, facts have accumulated to show that in America also we find extreme brachycephaly, as well among the prehistoric as among the historic peoples, from British America to Patagonia. At the same time extreme dolichocephaly is found, besides among the Eskimo, throughout the American Indian tribes, from north to south; but it cannot be considered an American craniologic characteristic, for among the Asiatic tribes dwelling nearest to the Eskimo (the Aleuts, for example), dolichocephaly in a marked degree is found, which fact is in absolute contradiction to Dr. Brinton's assertion (see, among other works, DE QUATREFAGES and HAMY, *Crania ethnica;* KOLLMAN, 'Die Autochthonen Amerika's,' in *Zeitschrift für Ethnologie*, 1883; TOPINARD, *Eléments d'Anthropologie générale;* and my own publications in American and Asiatic anthropology).

The value of the so-called 'Mongolian eye' (*l'oeil bridé*) may have been exaggerated as a racial characteristic: it is nevertheless very frequent among children, both of Mongolians and native Americans, as also among women, more than in any other race I know of. As it is admitted that in all races women and children show certain racial characteristics, especially those belonging to physiognomy, better than men, we may safely call the Mongolian eye a racial characteristic, though perhaps of less importance.

As regards the nasal index, before we can draw any conclusions from it, we have to make a distinction between the nasal index of the living (*sur le vivant*) and the nasal index of the bony skull, which often are in no correlation at all. Such is the case among the Eskimo, who are leptorrhinic, and belong at the same time to the same group as the American and northern Asiatic tribes.

To come to Dr. Brinton's last argument against the asserted Chinese traits of certain American tribes, I must say, that, although I never have seen any living Botocudo, I have examined their crania, and find that there is a certain resemblance between them and those of the Eskimo. If I am not wholly mistaken, Dr. Ph. Rey, who has also lived among the Botocudo, has pointed out this similarity in his anthropological study on this tribe (Paris, 1880).

I cannot say whether the tribes of the North-west Pacific coast have any Chinese traits, as I have not seen them myself; but this I can state, that among several tribes in North and South America (for example, Iroquois, Apaches, Hualapais, Maricopa, Pima, Carib, Arowak) I have seen persons who strongly resembled not only Chinese, but also Japanese and other Mongolians, and even Malays.

In some of them this similarity was so marked, that once on the Demerara River, in British Guiana, I questioned some Indians of the Ackawoio tribe, to convince myself that they were not Chinamen.

Dr. Brinton admits that the Eskimo "possess in some instances a general physiognomical similarity," concluding that "this is all," and "not worth much as against the dissimilarities mentioned." Does not Dr. Brinton know that physiognomy is really a very important consideration in racial distinctions? Every anthropologist knows that physiognomy is a complex of different traits, several of which are first-class racial characteristics. I will only mention the general shape of the forehead, the implantation and form of the nose, and the breadth and length of the face. If physiognomical characteristics had as little value as Dr. Brinton seems to think, then we might as well give up the study of physical anthropology altogether.

To recapitulate my criticism, I wish to say that Dr. Brinton's argumentation against the affinity between Americans and Mongolians is based upon entirely wrong reasoning. If the reasons he gives were correct, then the classification of the other races of the human species would be equally wrong; for in each of them peoples are grouped together, which, although related by physical characteristics, are linguistically and ethnologically entirely different from each other, not to speak of the difference in their psychological and social evolution.

When I admit that the native Americans are Mongoloids, I do not necessarily imply that America has been populated from Asia or elsewhere. However, if we accept the theory of evolution, this is the most probable explanation of the observed facts. But, leaving the doubtful origin of the Americans, and of their languages and arts, out of the question, I maintain that there is a physical similarity, racial affinity, and relationship between the indigenous Americans and the Mongolians in the widest sense.

This is, in the present state of anthropological knowledge, an undeniable fact. He who denies it does not believe in physical anthropology; and not to recognize this branch of science is equal to denying natural history in general.

DR. H. TEN KATE.

Mexico, Oct. 8.

[1] Although Dr. Brinton does not mention any ethnologic peculiarities as having been asserted in favor of the affinity between Mongolians and Americans (for they have been asserted), I think it would have been worth while to discuss them. What I said above about the study of archæology is equally true in regard to ethnology. Systematic and comparative, and, above all, empiric ethnological researches, both among the native Americans, especially the northern, and among different Mongolians, particularly the Siberian tribes, would throw much light upon their relationship. I think, for example, that we will never be able to understand thoroughly the ethnology of the Tinné tribes, as long as the Mongolians proper, and certain erratic tribes in the Gobi, have not been studied.

Queries.

38. WHEN WAS THE BILLION CHANGED? — Can any of the readers of *Science* state at what time, and from what incentive (by what fatuity), the people that has proposed a system of metrology for universal adoption depreciated the arithmetical *billion* (the second power of the million) to a nominal 'trillion,' making the anomalous 'billion' one-thousandth of its explicit value?

W. B. T.

Washington, D.C., Oct. 31.